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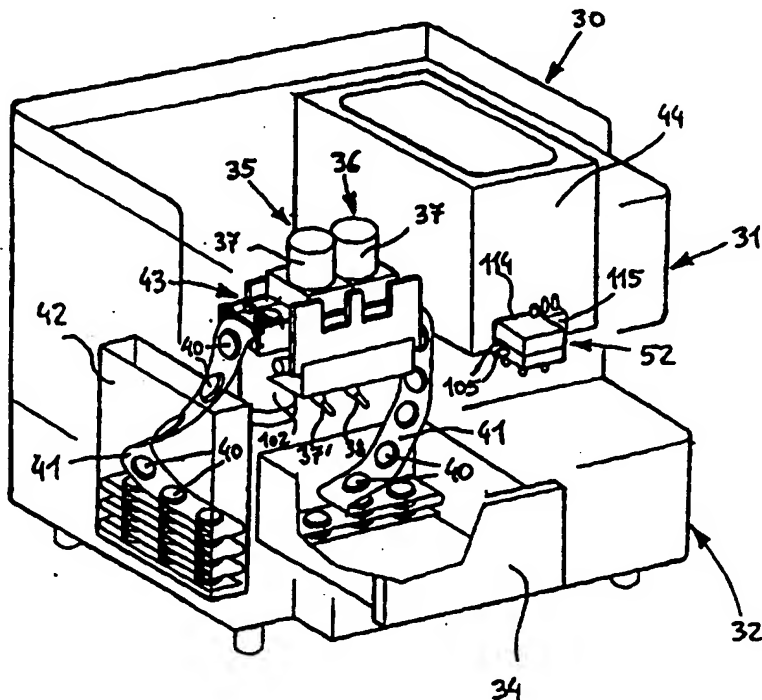
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<b>(21) International Application Number:</b> PCT/EP96/04737 <b>(22) International Filing Date:</b> 31 October 1996 (31.10.96)  <b>(30) Priority Data:</b> PN95A000056 6 November 1995 (06.11.95) IT  <b>(71) Applicant (for all designated States except US):</b> C.M.A. S.P.A. [IT/IT]; Via dei Colli, 42, I-31058 Susegana (IT).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> DAL TIO, Nello [IT/IT]; Via dei Colli, 43, I-31058 Susegana (IT).  <b>(74) Agent:</b> DALLA ROSA, Adriano; Via S. Vito, 13/B, I-33170 Pordenone (IT).	<b>(81) Designated States:</b> AU, BR, CA, JP, KR, NZ, RU, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	

**(54) Title:** MACHINE FOR PREPARING COFFEE, WHITE COFFEE OR SIMILAR INFUSED BEVERAGES, ON SINGLE OR MULTIPLE DOSIS THEREOF

**(57) Abstract**

Machine for preparing coffee, white coffee or similar infused beverages, on single or multiple dosis thereof, by utilizing some waffles (40) packed in advance, applied in a continuous band (41), on a number enough for preparing various coffees or other infused beverages. Machine comprising guide and feeding means (43) associated to the infusion units (35, 36) and the filters (97, 98) thereof, to determine the advancement of the band (41) through such infusion units (35, 36), by stopping each waffle in correspondence thereto for performing the relative infusion operation. Machine comprising also a mixer-emulsifier (52) with conduits (105) communicating or not communicating with the infusion units (35, 36) through a switching valve member (106), for preparing the white coffee or other infused beverages mixed with milk.



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**MACHINE FOR PREPARING COFFEE, WHITE COFFEE OR SIMILAR INFUSED BEVERAGES, ON SINGLE OR MULTIPLE DOSIS THEREOF.**

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The invention relates to a machine for preparing coffee, white coffee or similar infused beverages, which are distributed on single or multiple dosis thereof, wherein the coffee or the different raw materials for preparing the respective infused beverages are introduced into waffles packed in advance.

At the present time, there are known machines of different kind for preparing coffee, white coffee or similar infused beverages, comprising substantially one or more infusion units housed into a box-like housing and provided with a respective boiler for containing water, which is suitably heated by means of electric heating elements connected in the machine electric circuit, and one or more filters in which the ground coffee (or other raw material for the infusion) is introduced in advance, which filters are arranged on a position below the relative infusion units for permitting the heated water coming from the relative boiler to pass therethrough, thereby preparing the coffee or other infused beverages.

Moreover, in the case in which such machines are arranged for preparing white coffee too, they also include one or more mixer-emulsifier units of per se known type, communicating with at least a milk containing receptacle housed into said machine box-like housing, on a position above the correspondent mixer-emulsifier unit. Then, in this case the milk is heated in advance in the machine and introduced on metered amounts thereof in the correspondent mixer-emulsifier, where emulsifies itself with the air at pre-established ratio, thereby forming milk foam, which is subsequently introduced in the receptacle containing the cof-

fee or other infused beverage which have been prepared in advance in the machine, by mixing it therewith. These kinds of machines therefore permit to obtain coffee, white coffee or similar infused beverages with different operations, in which it is first of all needed the preparation of the ground coffee (or of the different raw materials for the other infused beverages), the introduction in the correspondent filter thereof, which filter has been detached from the machine in advance, and subsequently coupled in the same machine, and finally the introduction of the associated infusion unit for preparing the desired infused beverage, with the need to foresee another mixing with the milk foam thereof, in case in which infused beverages mixed with milk have to be prepared.

Moreover, there is to add the need to clean the different filters after a prolonged operation period thereof, for being re-used on subsequent operations of the same kind, which make complicate and less practical in the use on the operation and maintenance these machines, and permit the use thereof exclusively as machines for bar, wherein they are able to prepare infused beverages generally in a limited and discontinuous frequency, and therefore do not lend themselves evidently for uses in which a continuous preparation of numerous infused beverages is required such as for example in the community refectories and the like.

The present invention has the object to overcome the drawbacks and limits of the above mentioned machines, by means of the use of an automatic operating machine for preparing coffee, white coffee or similar infused beverages, adapted to prepare in a continuous manner both limited and high quantities of such infused beverages with a reduced number of operations thereof.

This machine is made with the substantially described characteristics thereof,

with particular reference to the attached patent claims.

The invention will be understood better from the following description given solely by way of not-limiting example and with reference to the accompanying drawings, wherein :

- 5 - Fig. 1 shows schematically a perspective front view of a machine in accordance to the invention, in a first embodiment thereof ;
- Fig. 2 shows with the same view the machine of Fig. 1, partially cutaway in a manner to make evident the inner component parts thereof ;
- Fig. 3a) shows in a perspective front view a band with the waffles prepared with the respective raw materials for the infusion, which band is stacked on yourself ;
- Fig. 3b) shows with the same view of Fig. 3a) a waffle of the band of such Figure, cutaway in a longitudinal direction along the line A-A ;
- Fig. 3c) shows a front view of the Fig. 3b) ;
- 15 - Figs. 4 and 5 show respectively a front and a plan view of the waffle band represented in the Fig. 3a) ;
- Fig. 6 shows a cutaway front view of a constructive item of the machine according to the invention, displaced in a first operative position thereof ;
- Fig. 7 shows a plan view of the constructive item of Fig. 6 ;
- 20 - Fig. 8 shows with the same view of Fig. 6 the constructive item displaced in a second operative position thereof ;
- Fig. 9 shows with the same view of Fig. 6 the constructive item displaced in the same operative position thereof and incorporating the waffle band ;
- Fig. 10 shows a plan view of the constructive item of Fig. 9 ;

- Fig. 11 shows with the same view of Fig. 8 the constructive item displaced in the same operative position and incorporating the waffle band ;
  - Fig. 12 shows schematically a front perspective view of another constructive item of the machine according to the invention ;
  - 5 - Fig. 13 shows schematically a cutaway front view of a further constructive item of the present machine, in a first version thereof ;
  - Figs. 14 and 15 show schematically a cutaway front view of two different versions of the constructive item of Fig. 13 ;
  - Figs. 16, 17 and 18 show respectively a schematic front view, a plan view 10 and a perspective front view of a component part of the constructive item of Fig. 13, made in another version thereof ;
  - Fig. 19 shows schematically a cutaway front view of the item with the component part of the Figs. 16-18 ;
  - Fig. 20 shows a part of the electric circuit diagram of the present machine ;
  - 15 - Fig. 21 shows schematically a perspective front view of the machine according to the invention, in a second embodiment thereof ;
  - Fig. 22 shows with the same view the machine of Fig. 21, partially cutaway so as to make evident the inner component parts thereof ;
  - Fig. 23 shows a cutaway front view of a constructive item of the machine 20 of Figs. 21 and 22, displaced in a first operative position thereof ;
  - Fig. 24 shows a plan view of the constructive item of Fig. 23 ;
  - Fig. 25 shows with the same view of Fig. 23 the constructive item displaced in a second operative position thereof.
- In the indicated Figures, it is represented schematically a machine accor-

ding to the invention, foreseen for preparing coffee, white coffee or similar beverages, on single or multiple dosis thereof, which operates fully automatically in a way to prepare in a continuous manner both limited and high quantities of such infused beverages, thereby allowing them to be employed respectively on bars and rooms  
5 where a distribution of such beverages with a limited and discontinuous frequency is needed, and on refectories, rooms etc.. where a continuous distribution of numerous infused beverages is needed. With particular reference to the Figs. 1 and 2, it is shown a first embodiment of this machine, which is arranged for preparing and distributing coffee, white coffee and other infused beverages both on single dosis for a person only  
10 and on double or multiple dosis for two or more persons.

To this aim, the machine referred to is substantially constituted by a box-like housing  
30 adequately dimensioned and shaped in a manner to form an upper portion 31 containing the different component parts of the machine, which will be described in detail later, and a lower portion 32 moved away from the precedent portion so as to  
15 form an interspace 33 with suitable volume, in which portion at least a slidable drawer 34 is housed, which is provided for receiving and removing the substances discharged from the machine after the preparation of the relative infused beverages, wherein such upper portion 31 and lower portion 32 are joined to each other for all the remaining machine structure. The machine upper portion 31 is structured for housing the com-  
20 ponent parts for preparing both the coffee or other infused beverages and the milk, which is mixed to the coffee thereby forming the white coffee, or it is mixed in case also to the other infused beverages. For convenience, in the present machine there will be described only the machine parts for preparing coffee and white coffee, but of course also other infused beverages, mixed or not mixed with milk, may be prepared

with the same criteria.

To this purpose, such upper portion 31 is provided internally with at least two infusion units 35 and 36 of per se known type, housed on the left side thereof on a position placed side-by side to each other, and comprising a respective boiler 37 for containing 5 and heating water, which is adequately connected to the water supply or any other separate water receptacle (not shown), through conduits and flow regulating members such as solenoid valves or the like (not shown), and associated with electric heating resistances (also not shown), provided for heating water and connected in the machine electric circuit with all the remaining control and regulating members thereof, which 10 are also housed into such upper portion 31.

The object of the infusion units 35 and 36 is that to prepare the coffee (or the other different infused beverages foreseen) by means of passage of hot water, which has been prepared and collected in the boilers of the same units, through adequate waffles packed in advance with the respective needed raw materials, which waffles are moved 15 from time to time in correspondence of such infusion units, with subsequent passage of the coffee or other so obtained infused beverages through a correspondent delivery spout 37' and 38 of conventional type, situated below the infusion units and the associated waffles, from which such beverage finally arrives on an underlying glass or similar receptacle, which is disposed below each spout by laying it onto the horizontal sup- 20 porting plane surface 39 constituting the upper closing surface of the machine lower portion 32. By referring now to the Figs. 2, 3, 4 and 5, there are shown the employed packed waffles, marked with the reference numeral 40, which are identical to each other and suitably shaped, with the doubly flared cylindrical form represented in the Figures referred to or also with different forms, and which are applied at a central po-



sition and at identical and pre-established spacings along a continuous band 41 formed by two strips of paper for foods or other suitable hygienic material, which is permeable to liquids and of limited width, joined together in a longitudinal direction thereof, in such a way that each waffle is included between such strips, and projected at the same  
5 measure from both the surfaces of the same band.

Each waffle band 41 is realized with an adequate length, and such as to permit to prepare various coffees (or other infused beverages) and is introduced in advance, by stacking and folding it on yourself, on a correspondent collecting magazine 42 having vertical extent, which is foreseen appropriately inside the present machine, at the left  
10 side thereof on a position placed side-by-side to the infusion units 35 and 36, from which such band is then extracted and advanced as it will be described through a guide and feeding mechanism 43 associated with the infusion units 35 and 36 and realized as described hereinafter, in a manner that the preparation of the infused beverages is determined on this zone by contact with the raw material contained into each waffle  
15 41, said band with the exhausted waffles being arriving finally from the guide and feeding mechanism 43 into the underlying slidable drawer 34, for being subsequently extracted at the end of all the foreseen infusion operations therefrom.

The machine upper portion 31 is also provided with a box-like tank 44 for containing milk, housed on a correspondent inner cavity of the same machine and accessible  
20 through an overturning closing lid 45, hinged to the upper wall 46 of such machine.

The tank 44 is associated preferably with a compression refrigerating system of conventional type, shown in the Fig. 12 in which it is evident the compressor 47, the finned refrigerating battery 48 acting as condenser, which in turn is cooled by an adequate fan 49, the desiccator 50, the capillary tube 51, while the evaporator of

such system, not evident from the Figure, is wound around the same tank, so as to cool it at a temperature enough to preserve the milk, which is contained in the correspondent vessels which are disposed into said tank.

In turn, the tank 44 communicates through suitable conduits (not indicated) with at least an underlying mixer-emulsifier 52, in turn communicating with the infusion units 35 and 36 on the positions which will be specified better later, in order to draw metered quantities of milk from each vessel housed in the tank 44 and convey them through the mixer-emulsifier 52, so as to prepare the white coffee or other infused beverages mixed with milk as it will be described subsequently, and finally to distribute them into an underlying glass or similar container, which is disposed below said mixer-emulsifier by supporting it on the machine horizontal plane surface 39.

Finally, the machine upper portion 31 is provided as usual with at least a conduit 53 for the passage of hot steam, joined to the steam generator which is also provided inside the machine, in order to heat at will the different distributed beverages.

For selecting the different operative programs to be performed, the present machine is provided with selection devices and indicators of electronic type, included in different separate control panelboards 54, 55 and 56 applied frontally on the machine upper portion 31 and associated to adequate control logic circuits (not shown) and to the different machine component parts, thereby to select and display from time to time the respectively needed operative programs, which are performed under the control through such logic circuits, as it will be described.

In particular, the control panelboard 54 is constituted by the set of selector push-buttons 57, 58, 59, 60 and 61 with the associated L.E.D. or similar luminous indicators, which indicate the respective on or off position thereof by turning on or off the light,

and by a display 62 (formed by a 2-lines LCD with 16 characters) for indicating the operative parameters and programs which are respectively selected through the push-buttons, as well as any possible alarm system provided in the machine for controlling the correct operation of the different component parts.

- 5 The push-button 57 serves for the selection of a single coffee dose, for a single person only (an espresso coffee), or the other infused beverages, which are distributed through the spout 37'. The push-button 58 serves for the selection of a respective single coffee dose, for two different persons (two espresso coffees), or the other infused beverages, which are distributed through the spouts 37' and 38.
- 10 The coffee dosis for one or two persons may be adjusted at will by acting on the same push-buttons as described, up to a maximal amount recommended by the manufacturer or distributor for maintaining an agreeable coffee taste.
- In turn, the push-button 59 serves for the selection of a coffee dose, however with the addition of a metered quantity of hot water (a weak espresso coffee),
- 15 for a single person, or the other infused beverages, which are distributed through the spout 37'. The push-button 60 serves for the selection of a respective coffee dose, however with the addition of a metered quantity of hot water (two weak espresso coffees) for two persons, or the other infused beverages, which are distributed through the spouts 37' and 38.
- 20 The push-button 61 serves to stop the machine operation (stop position) and to set the different parameters of each operative program which can be performed in the machine, by displaying them on the display 62, together with any possible foreseen alarm system, as well as the different machine operative programs which will be described hereinafter and which

are also displayed on the display 62, which programs are stored in advance in the software system of the associated control logic circuits made as integrated circuits, included on one or more electronic cards connected electrically to the panelboard 54 and the remaining panelboards 55 and 56.

5 In turn, the control panelboard 55 is constituted by the set of selector push-buttons 63, 64 and 65 with L.E.D. or similar luminous indicators associated therewith, which indicate the respective on or off position thereof by turning on or off the light.

The push-buttons 63 and 64 serve to regulate the hot water supply duration, respectively for preparing the infused beverages in the manner which will be described here-  
10 inafter and for different uses, such water being passing through a further conduit 64'.

The push-button 65 serves for time controlling the steam distribution, by passing it through the conduit 53.

Finally, also the remaining control panelboard 56 is constituted by a set of selector push-buttons 66, 67, 68, 69, 70 and 71 with L.E.D. or similar luminous indicators as-  
15 sociated therewith, which indicate the respective on or off position thereof by turning on or off the light, which position is also displayed on the display 62, said push-buttons being provided for regulating the distribution of milk coming from the associated vessel housed in the tank 44. In particular, the push-button 66 serves for the selection of a single dose of white coffee, for a single person (one white coffee), or milk mixed  
20 to other infused beverages which is distributed through the mixer-emulsifier 52.

The push-button 67 serves for the selection of a respective single dose of white coffee, for two different persons (double white coffee), or milk mixed with other infused beverages which is always distributed through the mixer-emulsifier 52.

As previously, also in this case each dose of coffee (or other infused beverage) to

be distributed in the same manner and for the same purpose as described above can be changed. The push-button 68 serves for the selection of a pre-established and variable milk dose, for a single person (a single dose of normal milk), which is distributed through the mixer-emulsifier 52.

5 The push-button 69 serves for the selection of a respective pre-established and variable milk dose, for two different persons (a double dose of normal milk), which is always distributed through the mixer-emulsifier 52.

The push-button 70 serves for the selection of a pre-established and variable dose of emulsified milk, for a single person, thereby forming milk foam, which is distributed  
10 through the mixer-emulsifier 52. Finally, the remaining push-button 71 serves to stop the machine operation (stop position) and to perform the same functions of the preceding push-button 61 of the control panelboard 54.

Turning now to the Fig. 1 again, it is noted that the present machine is provided additionally by two flat grates 73 and 74, applied onto corresponding through openings  
15 (not indicated) provided through the supporting plane surface 39, below respectively the delivery spouts 37' and 38 as well as the mixer-emulsifier 52 and the steam conduit 53 and the water conduit 64', in order to collect the liquids and wastes passing therethrough and to convey them on a tray (not indicated), included in the machine lower portion 32 and communicating with such through openings, for the subsequent  
20 elimination of these liquids and wastes.

Finally, the present machine is constituted by an overturning lid 75, applied on the upper portion 31 thereof, and extended below the control panelboards 54, 55 and 56, whose opening through an associated key 72 actuates a safety microswitch (not shown), connected in the machine electric circuit, which in turn provides for switching

off the electric supply of the whole machine, through an associate remote control switch (not shown too), thereby permitting the needed interventions on the different electric component parts of the same machine to be performed.

Turning now particularly to the Figs. 2 and 6-11, it is described the machine guide 5 and feeding mechanism 43, as well as the main component parts thereof and their operation mode. In particular, such guide and feeding mechanism 43 substantially comprises two flat and metallic rectilinear guide members 76 and 77 parallel and spaced away to each other, fixed in the machine at a position below the infusion units 35 and 36, supporting at their inlet end portion (at the left side) a set of idle 10 rollers 78, 79 and 80 and at their outlet end portion (at the right side) a set of powered rollers 81, 82, 83, 84 and 85, associated with a sprung system 86 and a bracket 87 provided with two shanks 88 and 89 fixed to the opposite guide member, of which the shank 89 projects vertically downward beyond the same powered rollers, for the reasons which will be described.

15 In particular, these powered rollers are driven by an associated electric motor 90 fixed laterally to such guide members 76 and 77, through suitable speed changing gear members (not shown) associated to such motor, in order to provide for advancing the waffle band 41 through the entire mechanism referred to, in the direction A, from the inlet end portion in which it is introduced with the waffles ready 20 for the infusion operation, to the outlet end portion thereof in which such band with the exhausted waffles after the infusion operation is entrained by said powered rollers into the underlying machine slidable drawer 34.

A sensor for sensing the presence of the waffle band 41 made advantageously as a microswitch 91 positioned near one of the idle rollers, in this case the roller 80, is also

provided on the inlet end portion of the above mentioned guide and feeding mechanism 43, which sensor is connected to the machine electric circuit and arranged for controlling the electric motor 90, in a manner to switch it on and off when said micro-switch respectively senses the presence or absence of the waffles 40 in the waffle band 41. In the case of presence of the band, such microswitch is operated by the passage of each waffle 40 from the one operative position to the other one thereof, by generating corresponding electric pulses which are recognized and counted by the machine control logic circuits, which as response provide for switching the electric motor 90 on when the first electric pulse generated by the initial portion of the first band waffle is sensed, thereby causing the same band to advance in the mechanism 43, and switching such motor off when the electric pulse generated by the initial portion of the subsequent waffle is sensed, thereby causing the band advancing to stop at such a position as one or two new waffles consecutive to each other are always positioned below the associated infusion units, waiting for the carrying out of the corresponding infusion operation with the criteria which will be described.

Let's now consider in detail the structural composition of the infusion units 35 and 36 which are constituted, in addition to the above mentioned boilers 37, which are placed side-by-side to each other and rigidly secured on the upper side of the guide and feeding mechanism 43, also by a movable unit portion 92 situated at a position below both the boilers 37 and reciprocatingly sliding along a set of vertical and parallel rods 93, secured to the lower side of said mechanism 43 and projected downward for a certain extent thereof.

Such movable unit portion 92 is provided with two hoppers 94 housed inside a cup 95, shaped with sizes almost corresponding to those ones of the pair of boilers 37 and

delimited at its lower side by a flat terminal wall 96.

The hoppers 94 are made integral with a respective half-filter 97 at the upper open end portion thereof, which is provided on a position and with sizes which are exactly corresponding to those ones of another half-filter 98, provided on a respective lower 5 through opening 99 of said boilers, said half-filters 97 and 98 being adapted to contain a respective waffle 40 packed in advance when they are moved at a position approached to each other as it will be described hereinafter.

The movable unit portion 92 is also provided with a further flat wall 100, at a position below and spaced away as well as parallel with respect to the preceding flat wall 96, 10 and is operated vertically with a reciprocating rectilinear movement by an eccentric or cam 101 or similar element, which receives a rotary motion from an electric motor 102 secured laterally the mechanism 43 and rotating in the interspace comprised between both the flat walls 96 and 100, in such a way as to act onto either one of such flat walls during the rotation thereof, so as to move the unit portion 92 from the lowered 15 position thereof shown in the Figs. 6 and 9, in which the half-filters 97 and 98 of each pair are moved away from each other, thereby permitting the waffle band 41 to pass therethrough, with consequent positioning of the waffles into such half-filter pair for performing the relative infusion operation, to a raised position shown in the Figs. 8 and 11, in which the half-filters 97 and 98 of each pair are approached to each other, 20 thereby providing to enclose the associated waffles positioned here and permitting the infusion operation thereof.

Moreover, this latter position is attained while dampening any possible impact stresses by bringing a lock 103 secured to the end portion of the flat wall 100 into abutment with the opposite end portion of the shank 89 of the bracket 87, with consequent com-



pression of the sprung system 86.

Besides, the hoppers 94 are tapered downward, so as to form a correspondent extended conduit 104, passing through the flat walls 96 and 100, and which extends up to the respective delivery spouts 37' and 38, into which it can slide with a limited stroke, 5 by keeping it always into contact therewith on both the lowered and raised positions of the movable unit portion 92, thereby permitting the coffee (or other infused beverage) to pass through each conduit 104 and the corresponding spout.

In turn, each extended conduit 104 is connected to the mixer-emulsifier 52 through a respective further conduit 105, in which a correspondent switching valve member 106 10 affecting the inflow port of such conduit is housed, which member is made as a solenoid valve or similar element, which can be operated on two different operative positions thereof, in the first of which it puts into communication the conduit 104 with the underlying delivery spout only, and not with the conduit 105 so as to interrupt the communication with the mixer-emulsifier, and in the second of which it puts into communication the conduit 104 with the conduit 105 only, and therefore with the mixer-emulsifier and not with the delivery spout.

Furthermore, each delivery spout communicates directly with the associated boiler through an auxiliary conduit, affected by a solenoid valve or the like and provided with an injector (all these components aren't indicated in the Figures) leading near the 20 same spout. The object of such auxiliary system is to permit pre-established metered quantities of hot water to pass through the respective spout, which water therefore is introduced in the underlying glass or receptacle before the coffee (or other infused beverage), so as to determine the additional metering (espresso coffee for one or two persons). Such an additional metering is adjusted by setting it in advance at the needed

amount with the push-button 59 on the control panelboard 54, thereby determining a change of the opening times of the solenoid valve associated to such an auxiliary conduit, and therefore of the delivered hot water quantity.

Turning now to the Fig. 20, in which it is represented the electric circuit diagram of the component parts of the infusion units 35 and 36, it is noted that these component parts substantially comprise a circulating pump 107 joined to the water supply or any possible separate water container (not shown) and the associated boilers 37 of said infusion units, through a respective volumetric meter 108 and 109 and a respective solenoid valve 110 and 111 or the like, connected in the machine electric circuit and controlled by the control logic circuits. In this case, the water quantities are counted by the volumetric meters 108 and 109, the adjustments of which are set in advance on the machine control panelboard 54, and introduced in the boilers through the solenoid valves 110 and 111, thereby providing for metering the coffee (or other infused beverage) to be delivered.

Such component parts also comprise the resistances, not indicated in the Figure, for heating water into the boilers and the steam generating boiler (not shown), with the associated temperature sensors, control and regulation switches, of which there are visible the microswitch 91 for sensing the presence of the waffle band 41 and the microswitches 112 and 113 for sensing the upper and lower end of stroke of the movable unit portion 92, as well as sensors for sensing the level and the minimum safety level into the steam boiler, as well as sensors for sensing and supervising the operation of the different component parts, and the like.

In addition, these component parts are regulated through relays controlled by signals generated by the machine control logic circuits, which in turn are assembled on a card.

Turning now to the Figs. 1, 2 and 13-19, it is represented schematically the mixer-emulsifier 52 for preparing and distributing either the white coffee, or other infused beverages mixed with milk, or the hot milk only, with or without foam.

Such mixer-emulsifier is substantially constituted by a first and a second box-like structure 114 and 115 having different dimensions, which are communicating and combined adequately to each other, and joined laterally to the conduits 105 communicating with the infusion units 35 and 36 as described previously, and provided at the upper side thereof with an air conduit 117, open at its upper side and affected by a relative solenoid valve or the like (not shown), the opening or closing of which respectively permits or prevents the air passage through the same conduit, as well as provided at the lower side thereof with one or more short conduits 118 for distributing either the coffee (or other infused beverage), or the white coffee (or other infused beverages mixed with milk), or the milk only.

In the Figs. 13-19, in particular, there are shown some possible versions of the mixer-emulsifier 52. In the Fig. 13 it is noted that such mixer-emulsifier is provided with a single lower conduit 118 and two further upper conduits 119 and 120, which are foreseen respectively for the passage of steam under pressure and milk and which are connected, through a correspondent solenoid valve or the like (not shown) to the steam generating boiler and the milk vessel, said conduits being connected to the other conduit 117 by means of a common manifold conduit 121.

In this way, the distribution of the white coffee (or other infused beverage) is obtained by opening at the same time the solenoid valves for the passage of

the milk, steam under pressure and air, thereby causing the milk to be heated by the steam under pressure and the emulsifying thereof with air sucked by venturi effect, with consequent milk foam production, and thereafter by effecting the mixing of this latter with coffee (or other infused beverage) introduced at the same time into the mixer-emulsifier through either one or both the conduits 105 connected to the infusion units referred to. In turn, the distribution of the single heated milk without foam production is obtained by interrupting the passage of coffee (or other infused beverage), and opening the solenoid valves for the passage of milk and steam under pressure, as well as closing the solenoid valve for air, with consequent preparation of hot milk without emulsifying it with air.

Similarly, the distribution of hot milk with foam is effected with the same sequences as described, with the additional opening of the solenoid valve for air, which therefore causes the emulsion of such milk with air.

In the Figs. 14 and 15 there are noted two other versions of the mixer-emulsifier, which are provided with one (or more) pairs of lower distribution conduits 118, onto at least one of which the conduit 105 of the infusion units leads (on the left side conduit in the Fig. 14, and on the right side conduit in the Fig. 15).

In the Figs. 16-18 it is noted a component part of the mixer-emulsifier made in another version. This component part is constituted by the box-like structure 114 provided with a pair of conduits 105 joined laterally thereto, for introducing coffee (or other infused beverage) therein, which conduits are bent downward by continuing then with a respective short portion of vertical conduit 123, as well as provided with a single upper conduit 124 joined at the lower side thereof to a pair of conduits 125 directed downward, which continue with a respective short

portion of vertical conduit 126, parallel to and spaced away from the preceding conduit portions 123, wherein such an upper conduit 124 can be coupled to the other box-like structure 115 of the mixer-emulsifier, which is provided with the same upper conduits 117, 119 and 120, and is evident from the Fig. 19.

5 In this way, the milk which is introduced through the mixer-emulsifier 52 is distributed through the conduits 125 into the glass, where it mixes itself with the coffee (or other infused beverage) in case distributed through the conduits 105.

There are now described briefly the operative cycles which can be performed with the machine according to the invention, which as explained permit the distribution either of the coffee only (or other infused beverage) by utilizing the waffles 40 packed in advance, or the white coffee (or other infused beverage mixed with milk) or the milk only, with or without foam.

First of all, in order to introduce a waffle band 41 in the machine, the upper portion 31 thereof is provided with at least a lid 128 for the access to a push-  
15 button of "SET ", which is operated to a switched on position thereof after that the extended initial end portion of the same band has been introduced in the inlet end portion of the guide and feeding mechanism 43, until such an extended portion positiones itself near the powered rollers 81-85, which engage it and therefore determine the band advancement, by stopping it as soon as the sensor  
20 91 senses the initial portion of the first waffle, which in turn is positioned upstream the first infusion unit 35. At this point, the machine is ready for the selection, which is effected by acting on the control panelboards 54, 55 and 56, of both the different desired operative cycles, and the respective dose of coffee (or other infused beverage) to be distributed, until the maximum amount thereof recommended by

the manufacturer or distributor, the adjustment of which determines a consequent change of the switching on time of the volumetric meters 108 and 109 associated to the respective infusion units 35 and 36.

Then, in the case in which the coffee distribution for one or two persons, without 5 metered addition of hot water, is selected by pressing either the push-button 57 or 58, this cycle foresees first of all the waffle band advancement up to position respectively a single waffle below the infusion unit 35 or two waffles consecutive to each other below the corresponding infusion units 36 and 35.

Afterwards, as soon as the waffle or waffles have reached this position, the eccentric 10 or cam 101 of the associated infusion unit is driven in rotation and therefore provides for displacing the correspondent unit portion 92 from its lowered position of Fig. 6 to its raised position of Fig. 8, in a manner that the corresponding half-filters enclose such waffle or waffles.

Thereafter, prior to perform the infusion operation in the associated infusion unit, 15 a brief pre-infusion step (of 1" approx.) is performed therein by switching on to this purpose solely the solenoid valve of this unit for such short time, with consequent passage of a reduced quantity of hot water which moistens the thin wall of the underlying waffle positioned there, thereby facilitating the carrying out of the subsequent actual infusion step and improving the quality of the obtained infused 20 beverage. The actual infusion step follows such pre-infusion step, and is performed by keeping the volumetric meter on for the previously selected period of time, which meter is associated to the infusion unit or units, with consequent distribution of the desired dose of coffee (or other infused beverage) respectively for one or two persons. Then, at the end of the infusion step, such eccentric or cam 101 is driven in

rotation again, thereby displacing the correspondent unit portion 92 from the raised position to the lowered position thereof, so as the correspondent half-filters do not more enclose the already used and exhausted waffle or waffles, and to switch the powered rollers 81-85 on for a short time (of approx. 0,5"), which is sufficient 5 to advance the waffle band 41, so as to move the exhausted waffle or waffles out of the half-filters, thereby preventing any undesired sticking of the same waffles between the half-filters. In the case in which the distribution of coffee for one or two persons, with metered addition of hot water, is selected by pressing either the push-button 59 or 60, at a desired pre-established quantity thereof which has been selected 10 ted in advance with the push-button 63 in a way to change the duration of the water supply as described previously, such a distribution is effected by introducing in the underlying glass first of all this additional hot water metering, and thereafter the coffee (or other infused beverage) which is prepared with the same operative steps as described.

15 In order to permit the end portion of each band to be sensed, on the condition in which all the waffles are exhausted, the numbers of electric pulses which will be generated by the sensor 91 after the passage of all the waffles therethrough, which correspond to the length of the same band, are stored in advance in the machine logic circuits by acting on the control panelboards of the same machine.

20 In this manner, as long as the waffles of the band are utilized, the sensor provides to generate the relative electric pulses which are counted progressively by the control logic circuits, and, as soon as these latter sense the presence of the last ten pulses, on the condition in which the last ten waffles are present below the infusion units, such condition is made evident on the display so as to inform the user

that the band will be exhausted imminently and needs to be replaced.

Then, when also the last waffles are exhausted, such logic circuits provide to make evident the exhausted band condition on the display, in order that the user provides for replacing it.

5 In order to perform this operation, the user must first of all actuate the "SET" push-button again, thereby switching the powered rollers 81-85 on for a short time (of approx. 5 min.), which is enough to advance the band in such a way that the last exhausted waffles are displaced out of the associated infusion units, thereby making free the infusion path and the correspondent half-filters.

10 At the same time to this, the volumetric meters and solenoid valves associated with the infusion units 35 and 36 are switched on, with consequent passage of water for cleaning the half-filters from the residuals of coffee or other raw materials employed for the infusion, thereby making them ready for performing the subsequent infusion steps with a new waffle band.

15 At the end of cleaning operation, the machine is set for the introduction of this new waffle band, and such condition is displayed on the display 62, together with the filling condition of the slidable drawer 34 with the substances discharged after the different infusion steps, which therefore presupposes the need of emptying these substances from the same drawer.

20 Afterwards, the new waffle band is introduced in the machine by repeating the same operations as described, with consequent carrying out of further operative cycles for the selection of coffee or other infused beverages which are identical to the above cited ones.

The present machine is programmed with its logic circuits for operating also in



the case in which any possible operative fault or failure occur, as for example the waffle band breakage, a not correct or incomplete compression of waffles, the machine supply lack and the like.

Then, in the case of waffle band breakage, this condition is made evident on the display 62, so that the user can remove the broken band portion from the machine by re-introducing the band extended initial end portion in the guide and feeding mechanism 43, and by repeating thereafter the same operations of band introduction as previously specified.

In the case of a not correct or incomplete compression of waffle, the unit portion 92 of the respective infusion unit does not reach its upper position or reaches it after a time longer than the pre-established time stored in the machine logic circuits, so as the sensor of the upper end of stroke 112 associated with the same unit portion 92 provides for signalling this operative defect on the display 62, in which condition the user selects the desired operative cycle again with the relative push-button, so that the unit portion 92 is lowered and then raised, thereby determining the correct waffle compression and the consequent distribution of the selected infused beverage.

In the case of supply lack in the course of an operative cycle, such cycle is considered ended so that the unit portion or portions 92 in the course of the infusion step return automatically from the raised to the lowered position thereof, and therefore it is needed that a new selection of the desired cycle is performed. Then, under these circumstances, when the machine supply is lacking, it is possible to prevent further selections by pressing the stop push-button 61 for a short period of time (of approx. 10"), by making evident such condition

on the display 62, by resetting the cycle selection capability again while pressing such push-button again for an equal period of time.

In the case in which the distribution of white coffee (or other infused beverage mixed with milk) is selected by pressing either the push-button 66 or 67, this cycle foresees firstly the distribution of milk and thereafter the distribution of coffee (or other infused beverage) in the underlying glass or receptacle.

To this purpose, when the milk is distributed, the machine logic circuits control the switching on of the solenoid valves associated with the respective conduits 117, 119 and 120 for air, steam under pressure and milk, for a switching on time correspondent to the milk dose to be obtained, which is stored in the above logic circuits and set in advance on the control panel-boards, and this condition is made evident by the display 62.

Subsequently, such logic circuits provide to control at the same time also the switching on of the infusion units 35 and 36 for preparing the coffee (or other infused beverage) with the same operative steps as described previously, and the switching valve member 106 housed in the conduit 105 connected between said infusion units and the correspondent mixer-emulsifiers 52, so as to switch such a valve member on its second operative position wherein said infusion units are communicating with the corresponding mixer-emulsifiers, thereby causing the coffee (or other infused beverage) to be deviated through the conduit 105 and consequently mixed with the milk in the underlying glass or receptacle.

In the case in which the distribution of the hot milk, without foam, is selected, it is pressed either the push-button 68 or 69, and the distribution of hot milk

with foam, it is pressed the push-button 70, in which circumstances the machine control logic circuits provide to keep the switching valve member 106 switched on its first operative position, in which said infusion units aren't communicating with the respective mixer-emulsifiers, by controlling also the switching on of the solenoid valves associated with the respective conduits 119 and 120 for steam under pressure and milk, and also the solenoid valve associated with the air conduit 117, for obtaining milk with foam only.

Then, in this latter case, the switching on of the solenoid valve is maintained for a time correspondent to the dose of hot milk with foam to be obtained, which is stored in the above mentioned logic circuits and set in advance on the control panelboards, by making evident such operative condition on the display 62. The present machine, moreover, foresees also the possibility to adjust, with the same selection criteria on the different control panelboards, the switching on times of the solenoid valve associated with the steam conduit, so as to change the heating temperatures for the relative beverages.

Finally, in the different machine control panelboards there can be selected also different adjustment values for the component parts and the sensors of various kind, as for example for the water level control and the boiler safety level, the heating resistances etc...

Turning now to the Figs. 21-25, in which a machine according to the invention in a second embodiment thereof is shown, it is noted that such machine is substantially identical to the just described one, and therefore its constructive items are indicated with the same reference numerals of the preceding one. However, this machine differs from the preceding one in that it fore-

sees the distribution of coffee (or other infused beverages) only, and not that of white coffee and milk, so as its relative component parts are eliminated, with consequent machine size reduction.

Besides, in this case the machine is foreseen for the distribution of a coffee 5 (normal or weak coffee) at a time, and to this aim it is provided with a single infusion unit 35 co-operating with a guide and feeding mechanism 43, which are made and operating as the similar component parts previously described. Then, in this case the machine is provided with three front push-buttons (not shown) for the selection respectively of a coffee (or other infused beverage) 10 with a normal dose (normal coffee), or with the hot water addition (weak coffee) as well as for stopping the machine operation (stop position) and setting the different operative programs and parameters of the same machine, with the same criteria as previously described.

This machine can be used both autonomously and combined with the previous 15 ly described machine, in such case by permitting advantageously to prepare de-cafeinized coffee, by introducing respective bands of waffles containing de-cafeinized coffee therein.

## CLAIMS

1. Machine for preparing coffee, white coffee or similar infused beverages, on single or multiple dosis thereof, comprising a box-like housing (30) provided with steam generation means and infusion means, shaped as boilers which can be supplied with water which is heated respectively for preparing steam under pressure and coffee or other infused beverages, by passing through filtering means containing the coffee or the raw material for the other infused beverages, as well as provided with means for mixing and possible emulsifying of coffee or other infused beverages with milk, contained into vessels housed into the box-like housing and in case cooled by means of a per se known refrigerating system, characterized in that the coffee or the other employed raw materials are contained inside a plurality of waffles (40) packed in advance and applied on a band (41), with a number enough for preparing various coffees or other infused beverages, and characterized by guide and feeding means (43) associated with said infusion means (35, 36) and said filtering means (97, 98), and adapted to cause said band (41) to advance through said infusion means (35, 36), for preparing selectively the coffee or other infused beverages ; switching means (106) communicating with said infusion means (35, 36), said filtering means (97, 98) and said mixing-emulsifying means (52), said switching means (106) being operable from a first to a second operative position thereof, in which they prevent or permit the communication of said infusion means (35, 36) and said filtering means (97, 98) with said mixing-emulsifying means (52), so as to determine the distribution of coffee or other infused beverages respectively not mixed and mixed with milk ; as well as characterized by means (108, 109) for regulating the metering of

the coffee or other infused beverages and the milk ; selection and control means (54, 55, 56) being also associated with said guide and feeding means (43), said infusion means (35, 36), said filtering means (97, 98), said switching means (106) and said regulating means (108, 109), for the selection and metering of the different infused  
5 beverages to be prepared and distributed and for preparing and distributing the respectively selected and metered infused beverages.

2. Machine according to claim 1, characterized in that said guide and feeding means (43) comprise two flat rectilinear guide members (76, 77), parallel and spaced away to each other, fixed in the machine at a position below said infusion means (35,  
10 36) and supporting at an end portion thereof a set of idle rollers (78, 79, 80), associated to at least a sensor (91) for sensing the presence or absence of said band (41), and at the other end portion thereof a set of powered rollers (81, 82, 83, 84, 85), driven in rotation by an electric motor (90) fixed laterally to said guide members (76, 77), in order to provide for advancing in a single direction (A) said band (41),  
15 from a correspondent collecting magazine (42) having vertical extent, placed side-by-side to said infusion means (35, 36), by passing in succession through said first end portion, said infusion units (35, 36) and said filtering means (97, 98), as well as said second end portion of said guide members (76, 77), up to arrive to at least an underlying containing drawer (34) applied slidably in the machine, said powered rollers (81, 82, 83, 84, 85) being associated to a sprung system (86) and a bracket  
20 lers (81, 82, 83, 84, 85) being associated to a sprung system (86) and a bracket (87), provided with a first and a second shank (88, 89) fixed to the opposite guide member, of which this latter shank projects vertically downward beyond the same powered rollers, said powered rollers (81, 82, 83, 84, 85) being adapted to cause said band (41) to advance or to be stopped at a position below at least one of said

infusion means (34, 35) and said filtering means (97, 98), on the respective conditions in which said sensor (91) senses the initial portion of a waffle (40) and that one of the waffle directly following thereto.

3. Machine according to claim 2, characterized in that said sensing sensor (91) also  
5 provides for counting all the waffles of each band (41), by signalling the end band condition through display means (62) associated to said selection and control means (54, 55, 56) for the subsequent replacement of said band (41) with a new band.
4. Machine according to claim 3, characterized in that said infusion means comprise at  
10 least a first and a second infusion unit (35, 36), each one of which constituted by at least a movable unit portion (92) situated below the associated boilers (37) of the same infusion units, and delimiting with the correspondent boiler said filtering means (97, 98), as well as slidable reciprocatingly along a set of vertical and parallel rods (93) secured to the lower side of said guide and feeding means (43), said movable  
15 unit portion (92) being driven in a vertical direction by an eccentric or cam (101) or similar element, which receives the rotary motion from at least an electric motor (102) secured laterally said guide and feeding means (43), from a lowered position to a raised position thereof, and vice versa, in which said movable unit portion (92) is respectively moved away and approached with respect to the corresponding boiler (37), thereby permitting the waffles (40) of said band (41) to be positioned freely  
20 and enclosed between said filtering means (97, 98), for performing the infusion operation.
5. Machine according to claim 4, characterized in that each boiler (37) is supplied with water through said regulating means (volumetric meters 108, 109 and solenoid valves 110, 111).

6. Machine according to claim 4, characterized in that said movable unit portion (92) is provided with at least a lock (103) co-operating with said shank (89) to dampen the impact stresses, as well as at least a hopper (94) associated to each infusion unit (34, 35), and supporting at its upper opened end portion a first half-filter (97), co-operating with a second half-filter (98), secured at the lower side to the correspondent boiler (37) and forming with the preceding half-filter said filtering means, said hopper (94) being tapered downward so as to form at least an extended conduit (104) for the passage of coffee or other infused beverage, which is housed slidably into the correspondent spouts (37', 38) for distribution of coffee or other infused beverages, by keeping into contact therewith on both the lowered and raised positions of said movable unit portion (92).
7. Machine according to claim 6, characterized in that each delivery spout (37', 38) is communicating directly with the associated boiler (37) through an auxiliary conduit, affected by said regulating means (solenoid valve or the like), and provided with an injector leading near the same spout, for preparing pre-established metered quantities of hot water to be added to the coffee or other infused beverage, prior the preparation thereof.
8. Machine according to claim 6, characterized in that said switching means comprise at least a valve member (106) made preferably as a solenoid valve or similar element, housed in a conduit (105) communicating with said extended conduit (104) and said mixing-emulsifying means (52).
9. Machine according to claim 8, characterized in that said mixing-emulsifying means (52) comprise a first and a second box-like structure (114, 115), communicating and combined to each other, joined to said conduit (105), at least a distribution conduit



(118) and respective conduits (117, 119, 120) for the passage of air, steam under pressure and milk, through said regulating means (solenoid valves or the like), with selective or contemporaneous control, depending on the fact that beverages mixed with milk, or milk only, respectively without or with foam, must be distributed.

- 5 10. Machine according to the preceding claims, characterized in that it is constituted as an autonomous unit, comprising exclusively a single infusion unit (35).

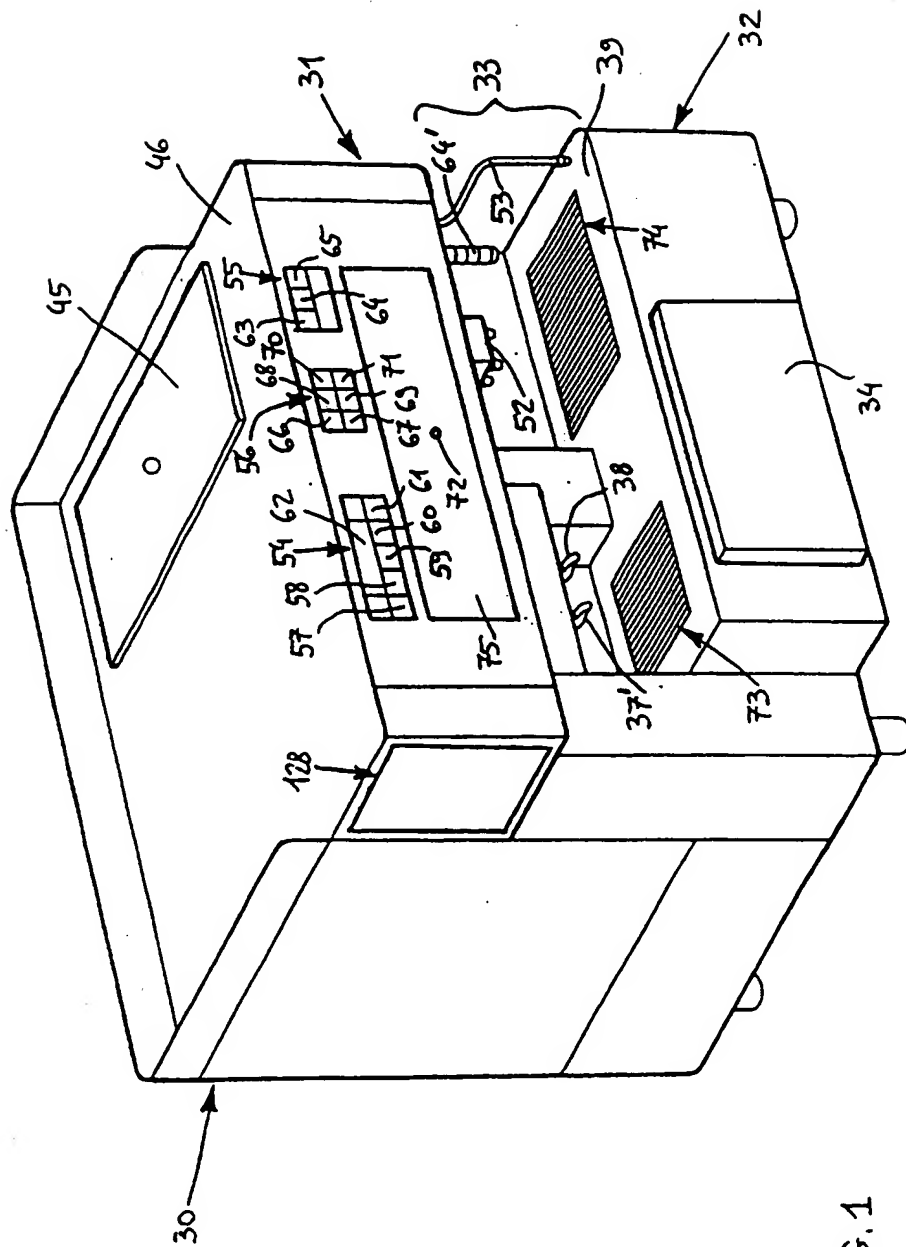


FIG. 1

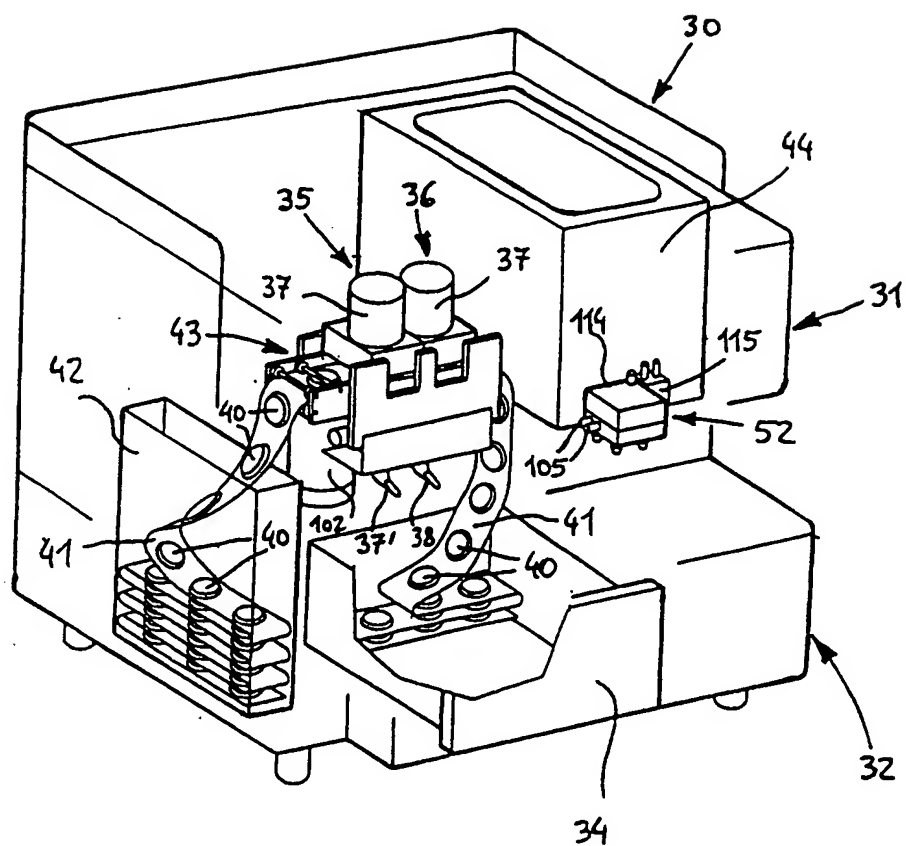
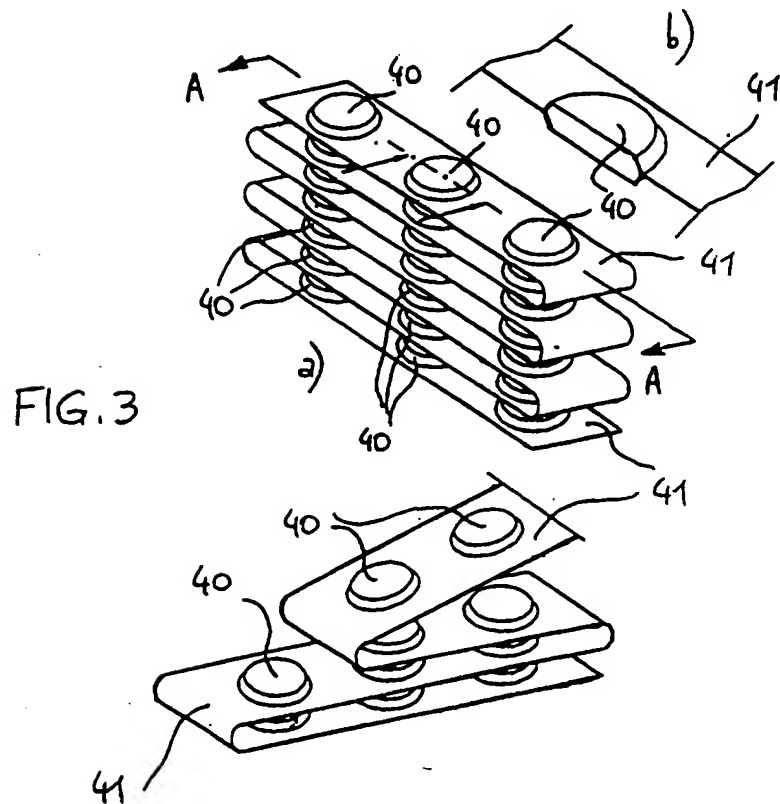
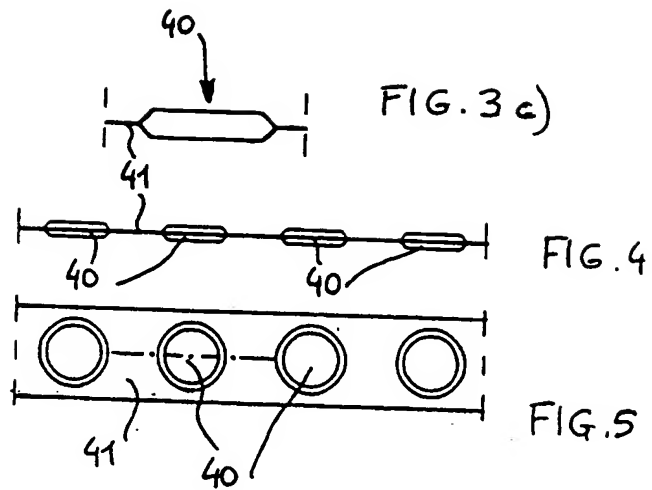
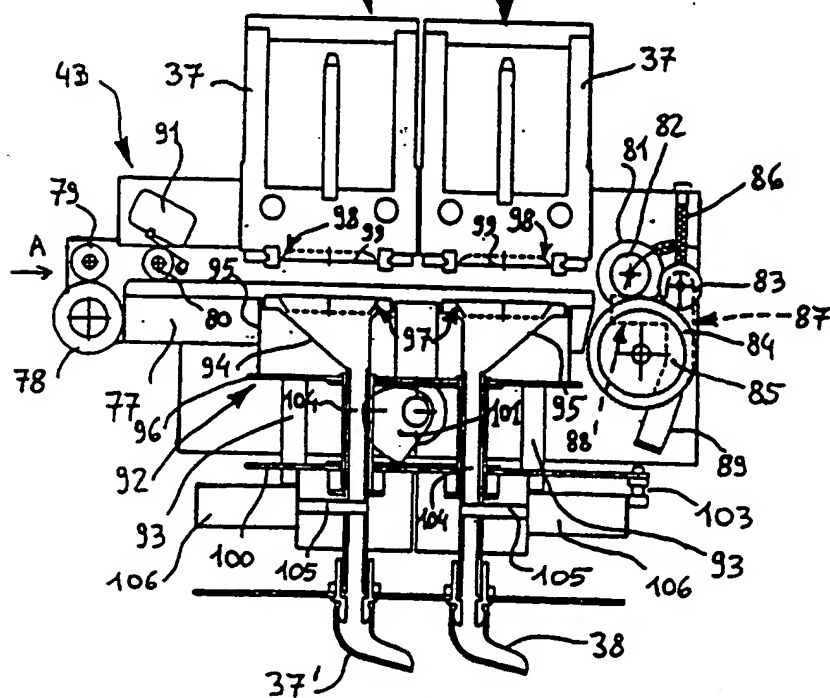
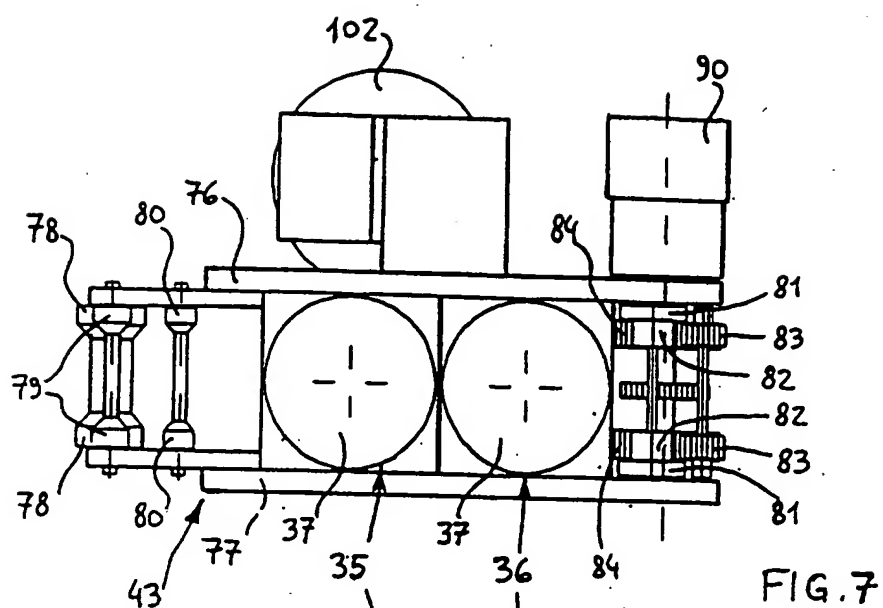


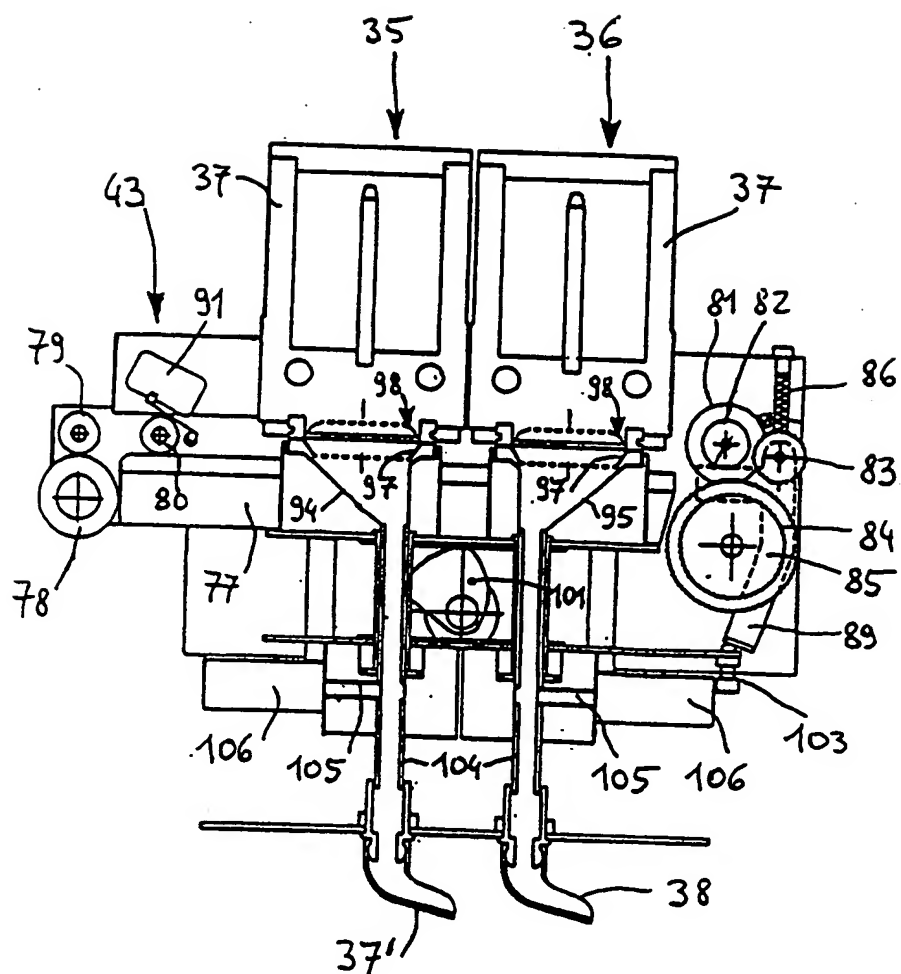
FIG. 2

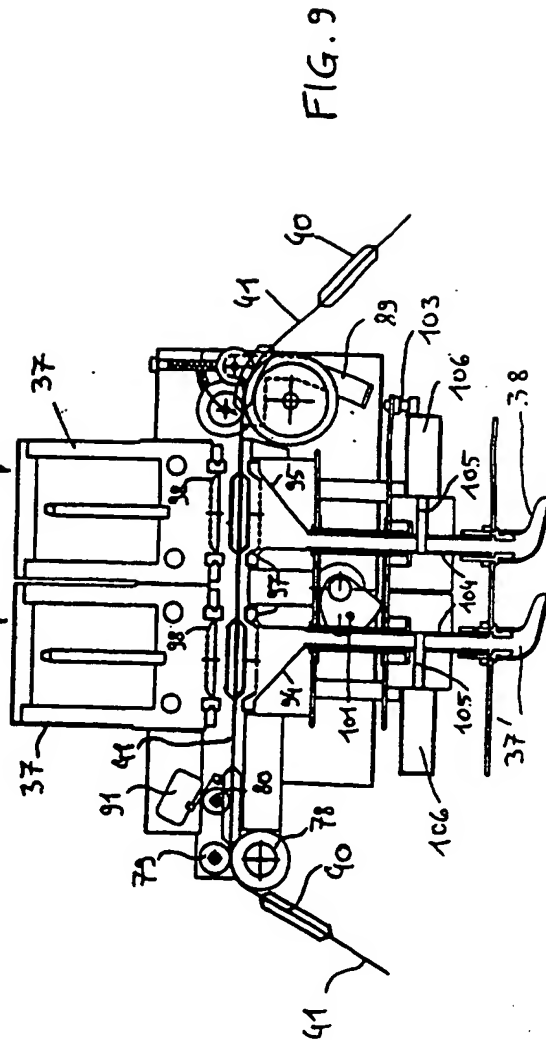
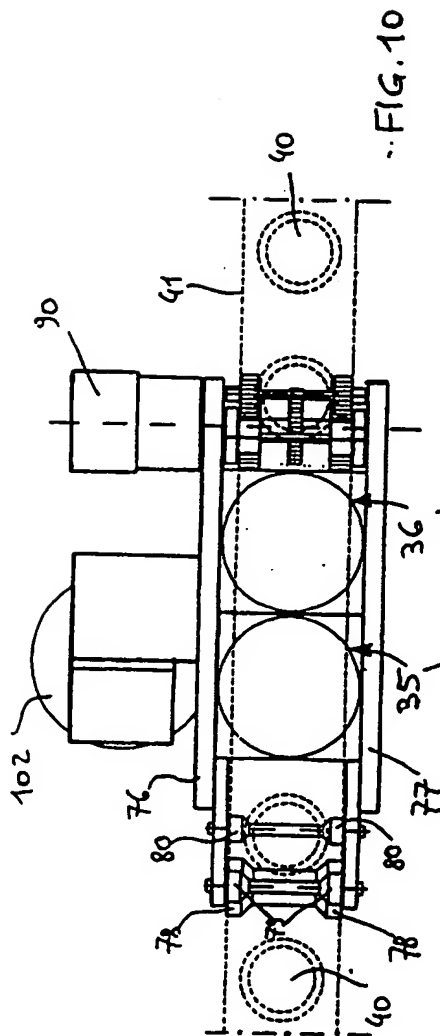




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FIG. 8





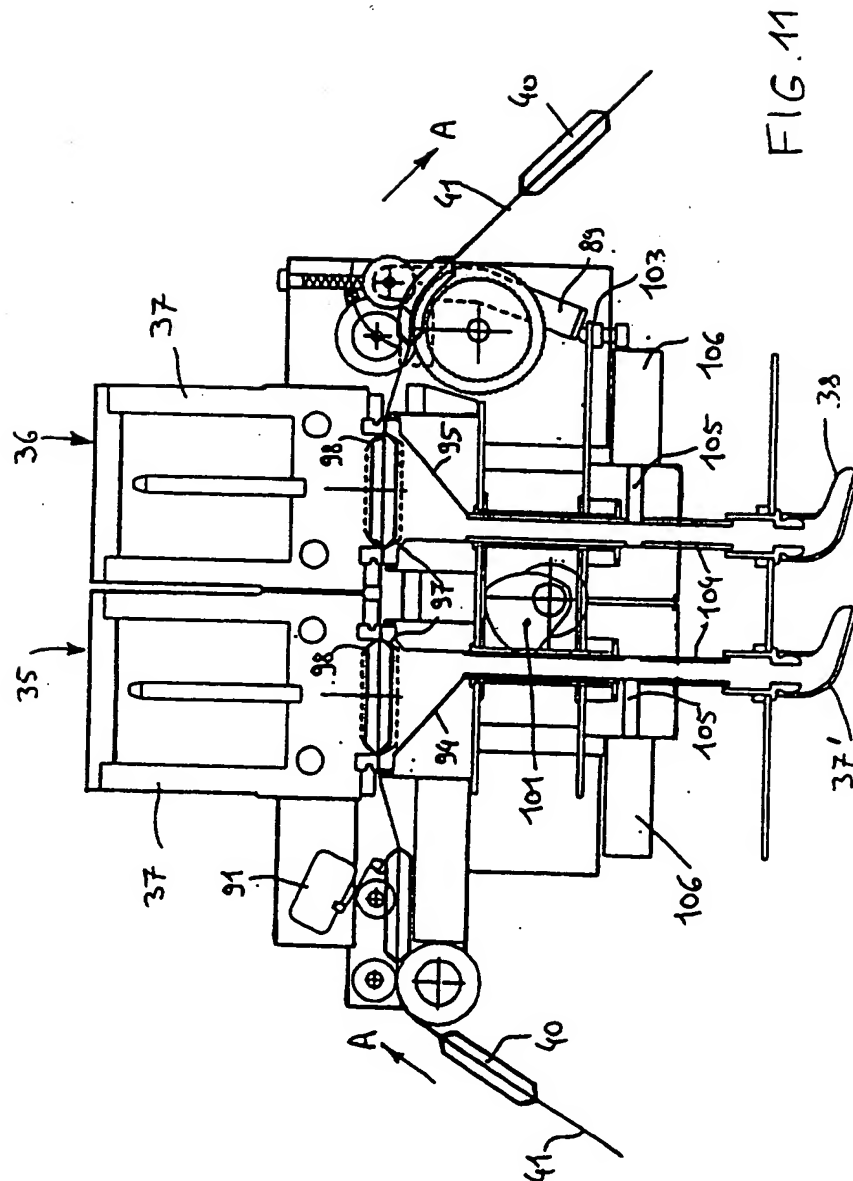
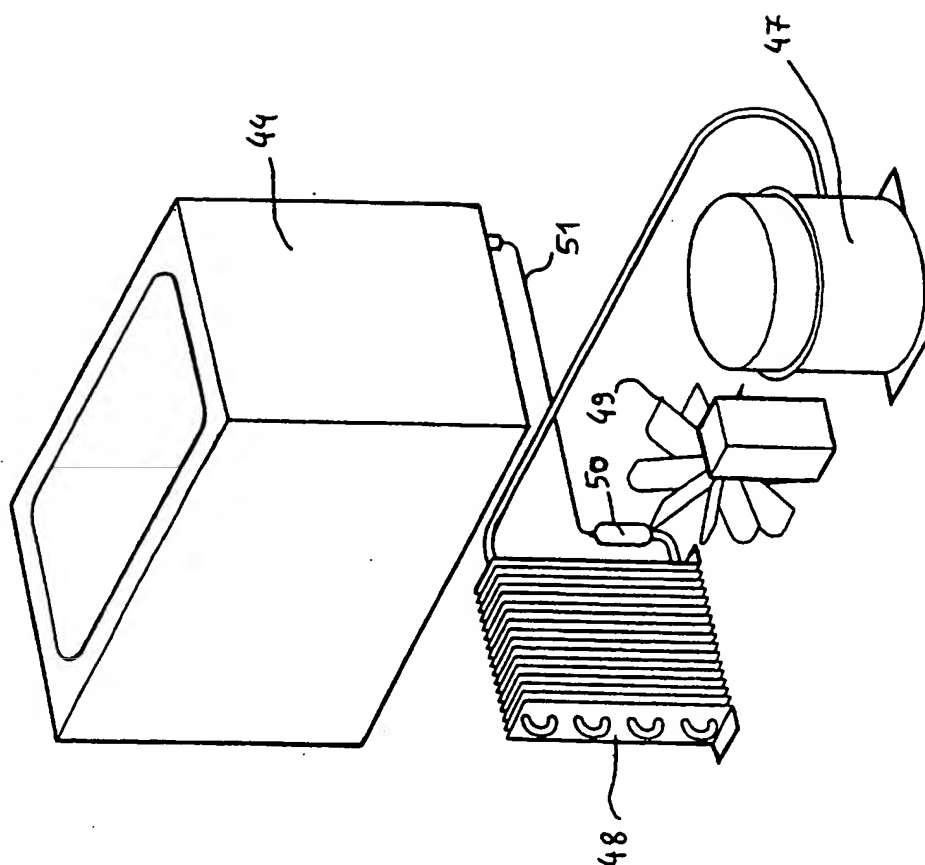
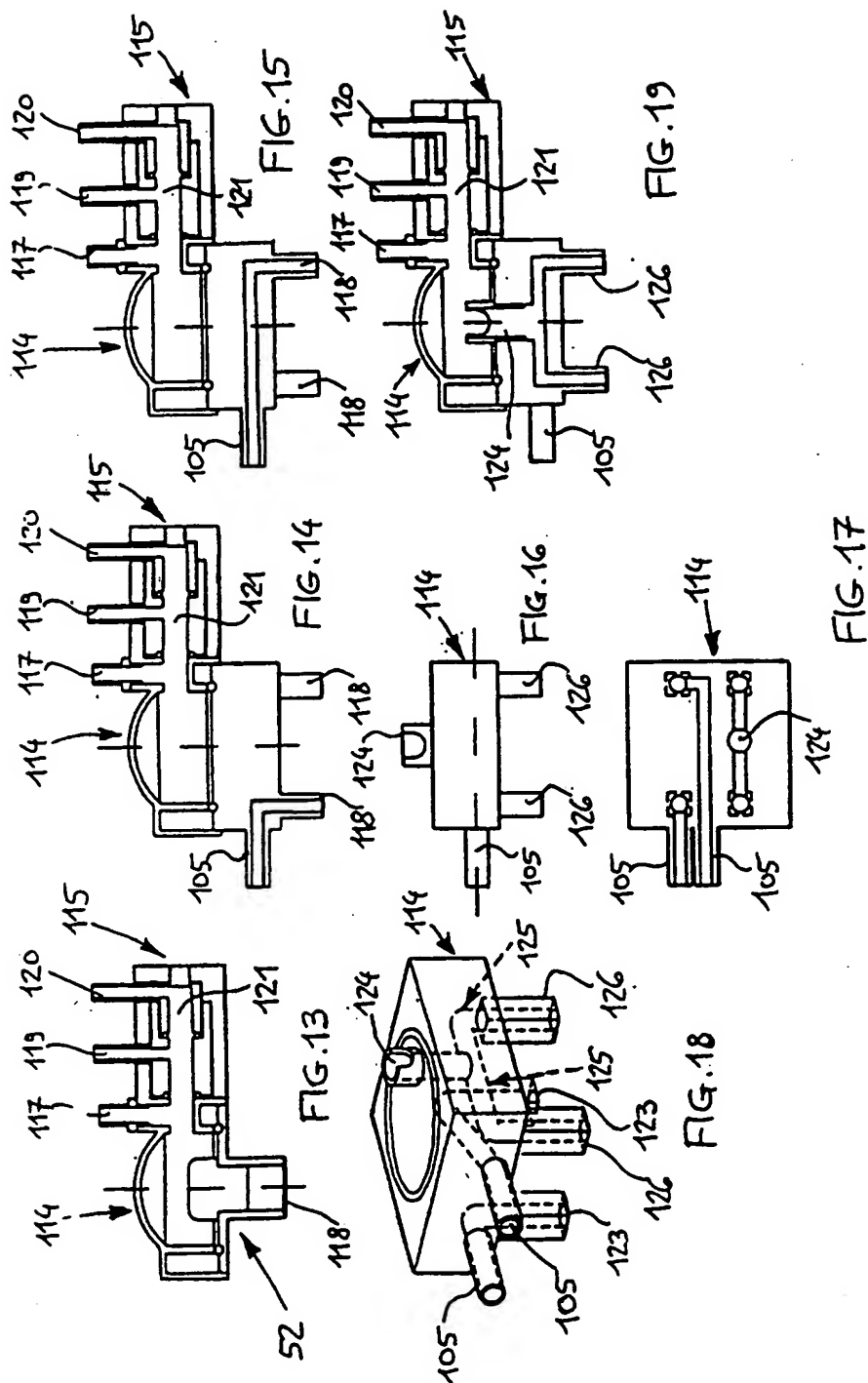


FIG. 11



FIG. 12





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FIG. 20

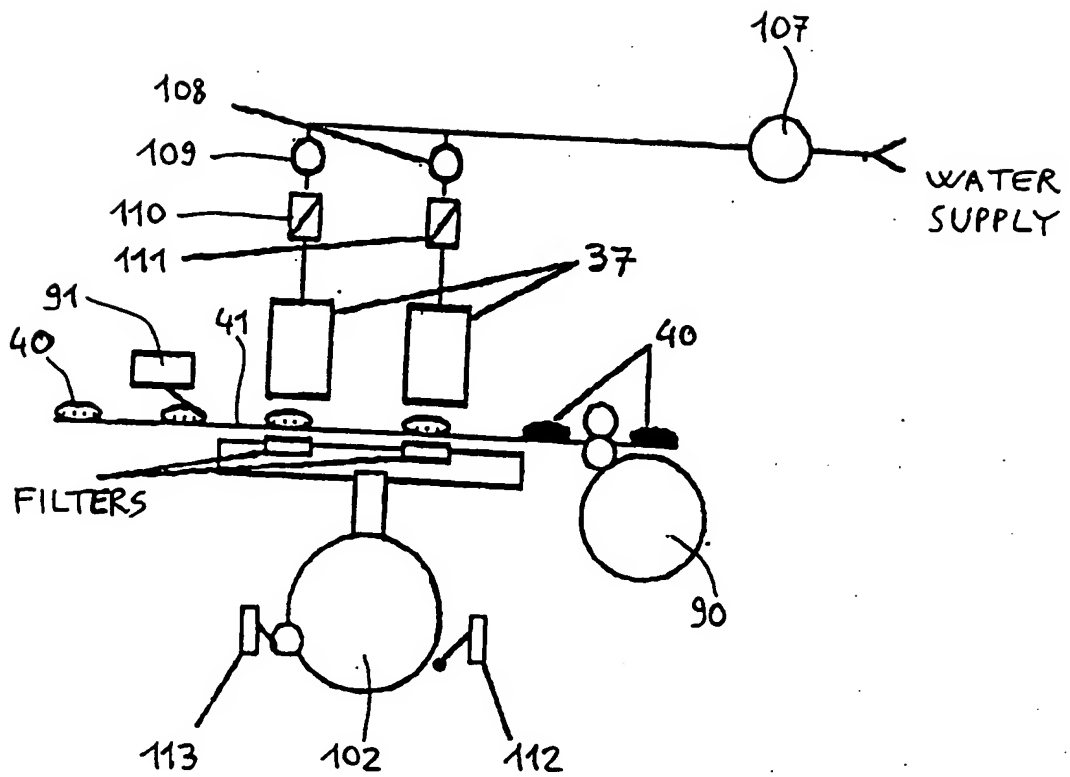
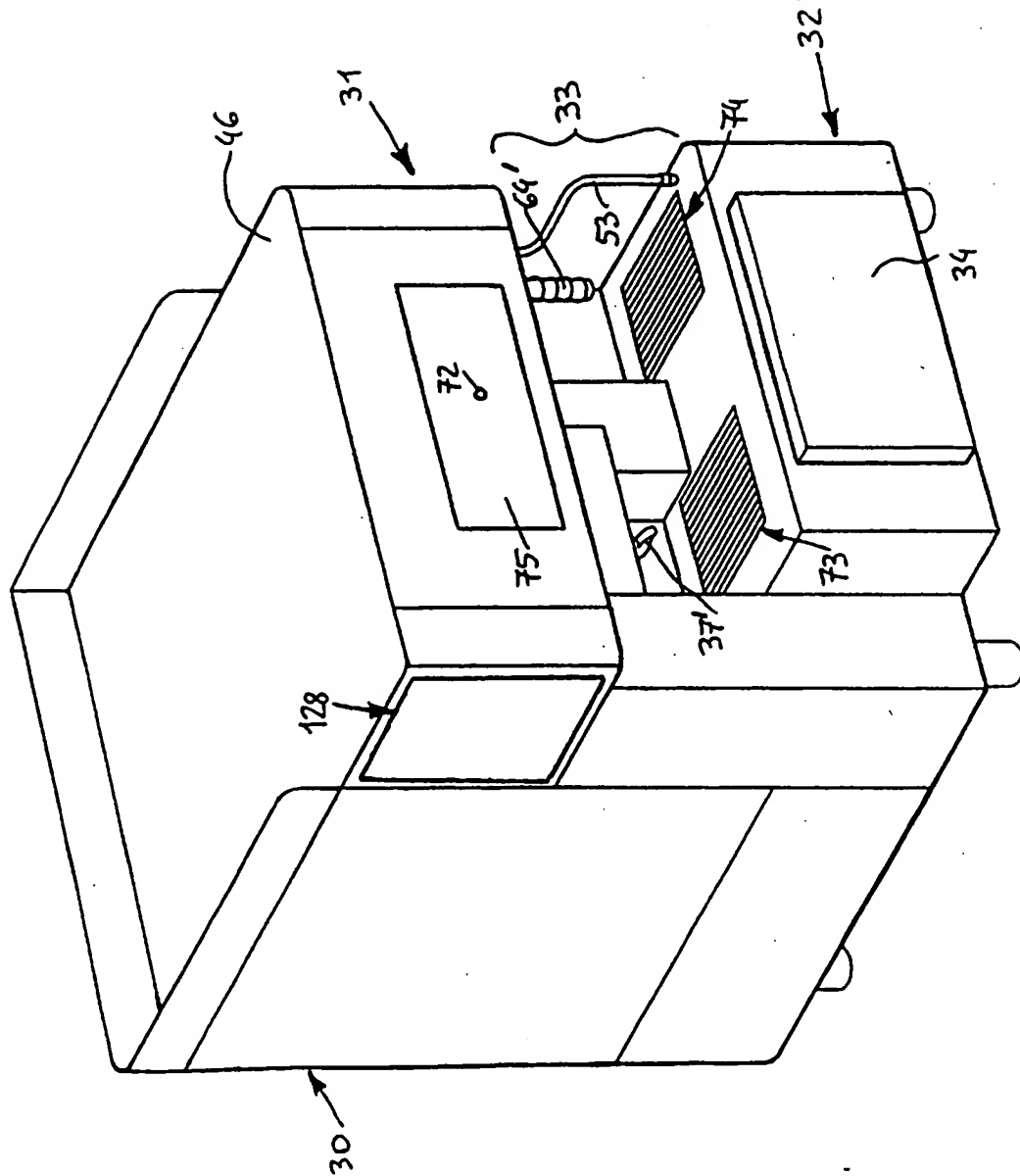


FIG. 21



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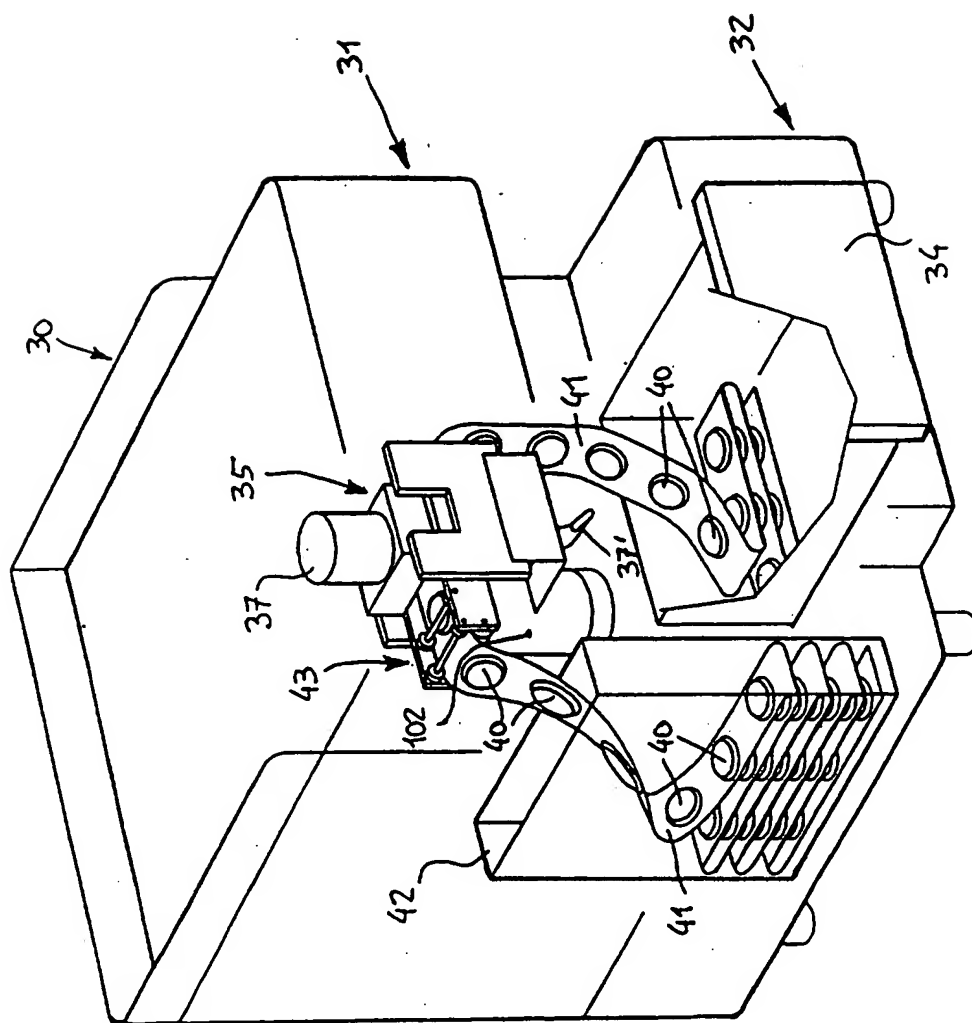


FIG. 22

FIG. 24

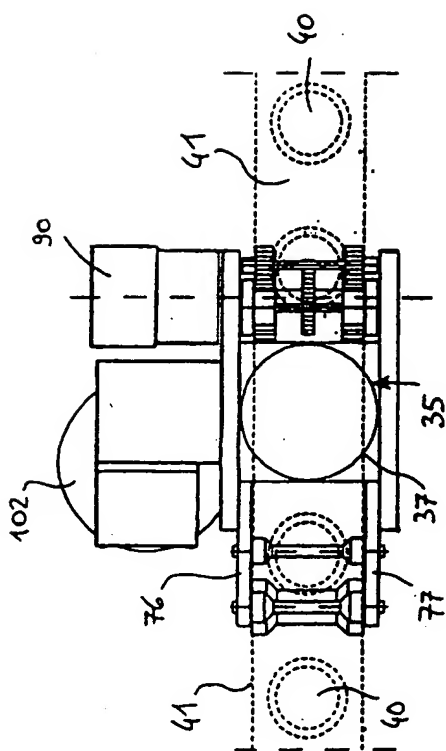


FIG. 23

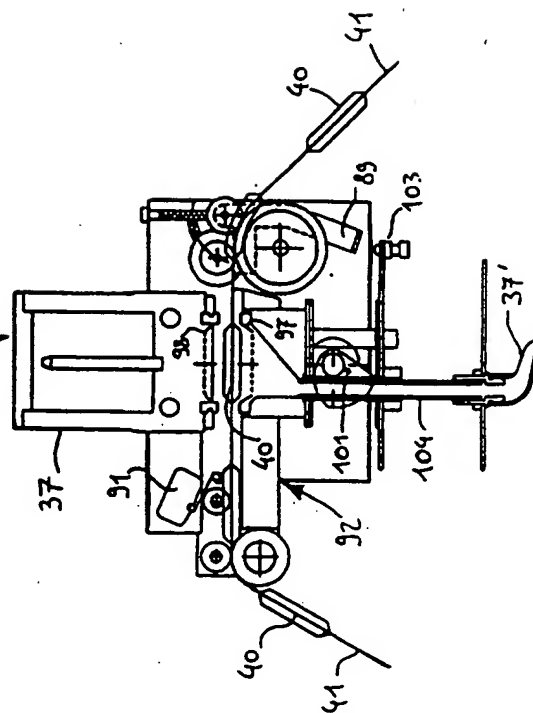
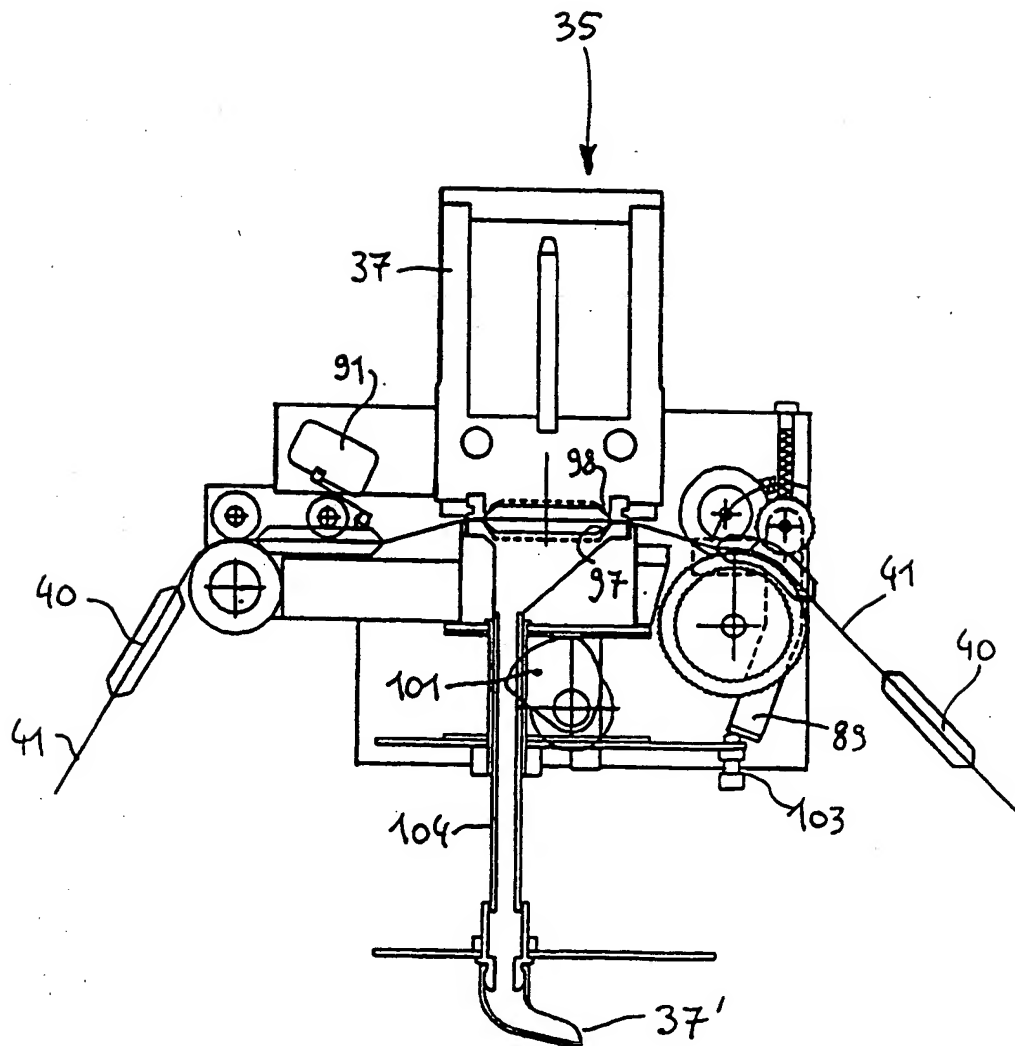


FIG. 25



## INTERNATIONAL SEARCH REPORT

International Application No.

PC/EP 96/04737

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A47J31/40 A47J31/46

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 353 692 A (R.J. REESE ET AL.) 11 October 1994 see column 4, line 7 - line 27; figure 1 see column 7, line 48 - line 68; figures 4,5 ---	1,2
A	WO 95 11613 A (NUOVA FAEMA SPA) 4 May 1995 see page 39, paragraph 2 - page 45, paragraph 1; figures 7,9,10 ---	1,9
A	EP 0 117 118 A (EQUIPMENT SERVICE LTD) 29 August 1984 see abstract; figure ---	1
A	EP 0 093 366 A (ILLYCAFFE SPA) 9 November 1983 see abstract; figure 1 see page 8, paragraph 2 ---	1-3
-/-		

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

28 February 1997

Date of mailing of the international search report

14. 03. 97

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Schmitt, J



## INTERNATIONAL SEARCH REPORT

International Application No  
PC1/EP 96/04737

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International Application No

PC1/EP 96/04737

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